

STM32 CubeMX

1. Description

1.1. Project

Project Name	SPBTLE
Board Name	STEVAL-MKSBOX1V1
Generated with:	STM32CubeMX 6.2.1
Date	08/29/2021

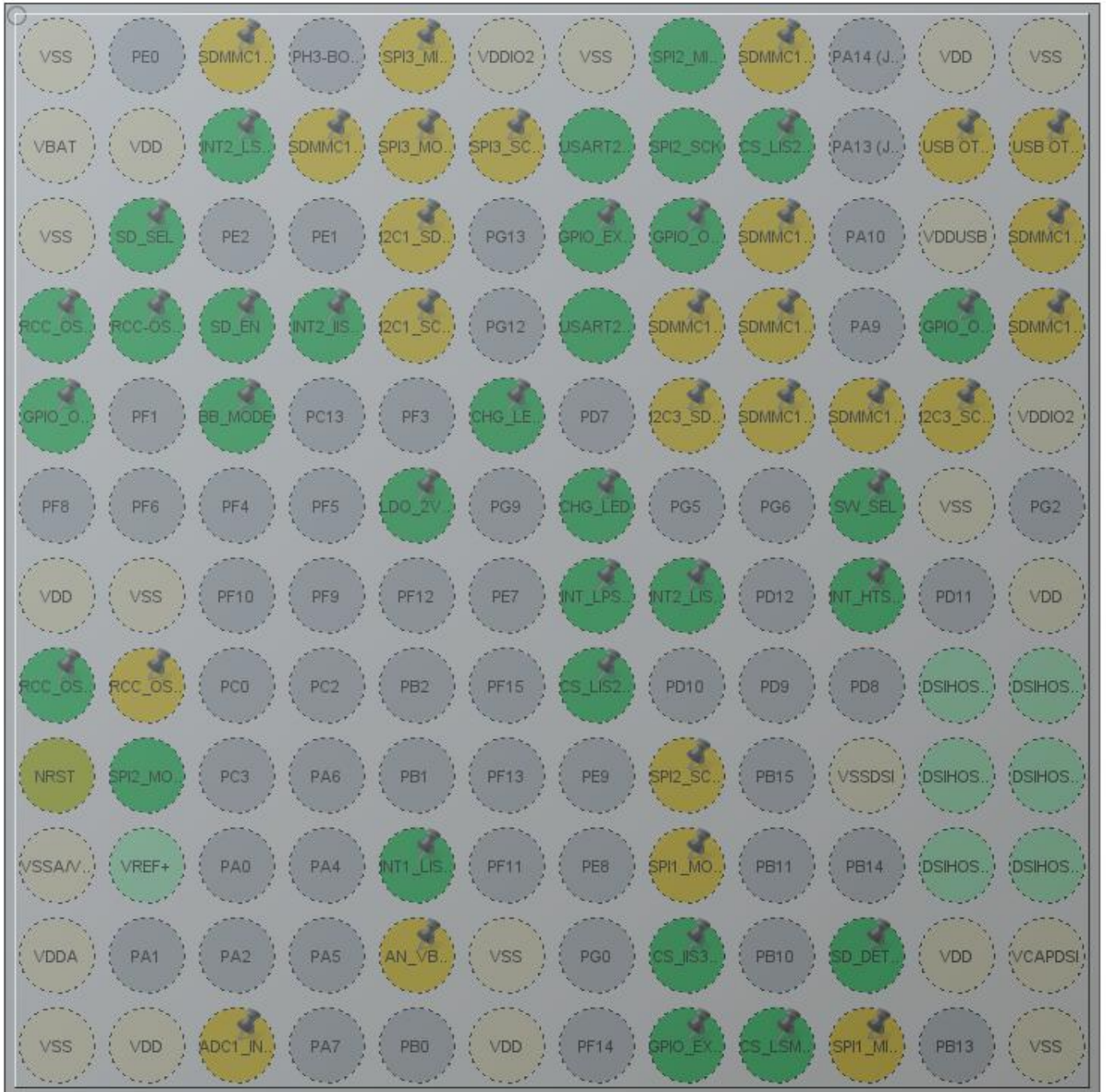
1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4R9/S9
MCU name	STM32L4R9ZIJx
MCU Package	UFBGA144
MCU Pin number	144

1.3. Core(s) information

Core(s)	Arm Cortex-M4
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2. Pinout Configuration



UFBGA144 (Top view)

3. Pins Configuration

Pin Number UFBGA144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
A1	VSS	Power		
A3	PB9 *	I/O	SDMMC1_CDIR	SDMMC1_CDIR
A5	PB4 (NJTRST) *	I/O	SPI3_MISO	SPI3_MISO [SENSORS]
A6	VDDIO2	Power		
A7	VSS	Power		
A8	PD3	I/O	SPI2_MISO	
A9	PC11 *	I/O	SDMMC1_D3	SDMMC1_D3
A11	VDD	Power		
A12	VSS	Power		
B1	VBAT	Power		
B2	VDD	Power		
B3	PE3	I/O	GPIO_EXTI3	INT2_LSM6DSOX
B4	PB8 *	I/O	SDMMC1_CKIN	SDMMC1_CKIN
B5	PB5 *	I/O	SPI3_MOSI	SPI3_MOSI [SENSORS]
B6	PB3 (JTDO/TRACESWO) *	I/O	SPI3_SCK	SPI3_SCK [SENSORS]
B7	PD6	I/O	USART2_RX	
B8	PD1	I/O	SPI2_SCK	
B9	PA15 (JTDI) **	I/O	GPIO_Output	CS_LIS2MDL
B11	PA12 *	I/O	USB_OTG_FS_DP	USB OTG DP
B12	PA11 *	I/O	USB_OTG_FS_DM	USB OTG DM
C1	VSS	Power		
C2	PE5 **	I/O	GPIO_Output	SD_SEL
C5	PB7 *	I/O	I2C1_SDA	I2C1_SDA [ENV SENSORS]
C7	PD4	I/O	GPIO_EXTI4	
C8	PD0 **	I/O	GPIO_Output	
C9	PC10 *	I/O	SDMMC1_D2	SDMMC1_D2
C11	VDDUSB	Power		
C12	PC9 *	I/O	SDMMC1_D1	SDMMC1_D1
D1	PC14-OSC32_IN (PC14)	I/O	RCC_OSC32_IN	RCC_OSC32_IN
D2	PC15-OSC32_OUT (PC15)	I/O	RCC_OSC32_OUT	RCC-OSC32_OUT
D3	PE4 **	I/O	GPIO_Output	SD_EN
D4	PE6	I/O	GPIO_EXTI6	INT2_IIS3DHHC
D5	PB6 *	I/O	I2C1_SCL	I2C1_SCL [ENV SENSORS]
D7	PD5	I/O	USART2_TX	
D8	PD2 *	I/O	SDMMC1_CMD	SDMMC1_CMD
D9	PC12 *	I/O	SDMMC1_CK	SDMMC1_CK

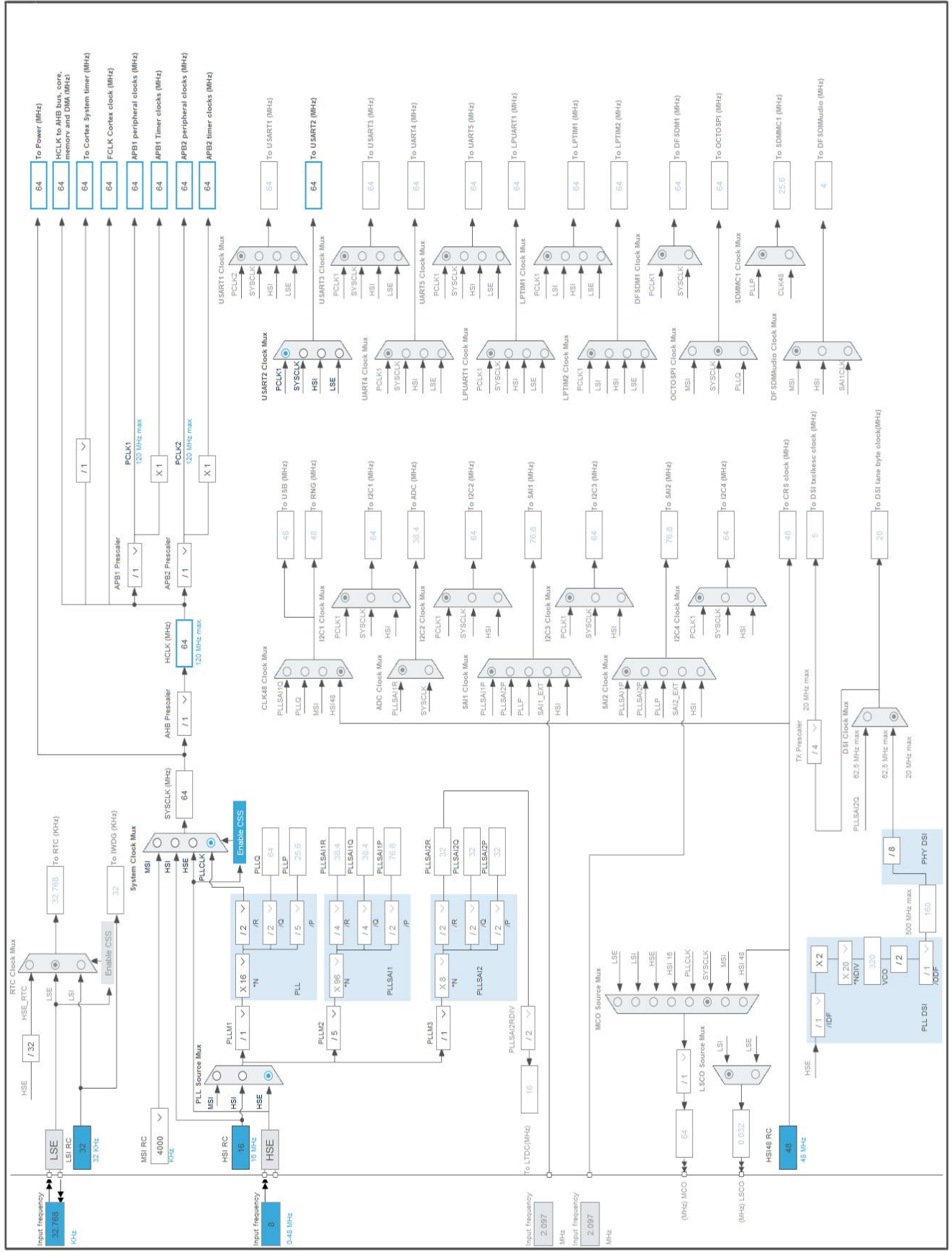
Pin Number UFBGA144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
D11	PA8 **	I/O	GPIO_Output	
D12	PC6 *	I/O	SDMMC1_D0DIR	SDMMC1_D0DIR
E1	PF2 **	I/O	GPIO_Output	
E3	PF0 **	I/O	GPIO_Output	BB_MODE
E6	PG10 **	I/O	GPIO_Output	CHG_LED2
E8	PG8 *	I/O	I2C3_SDA	I2C3_SDA [TEMPERATURE]
E9	PC7 *	I/O	SDMMC1_D123DIR	SDMMC1_D123DIR
E10	PC8 *	I/O	SDMMC1_D0	SDMMC1_D0
E11	PG7 *	I/O	I2C3_SCL	I2C3_SCL [TEMPERATURE]
E12	VDDIO2	Power		
F5	PF7 **	I/O	GPIO_Output	LDO_2V7_EN
F7	PG3 **	I/O	GPIO_Input	CHG_LED
F10	PG4 **	I/O	GPIO_Output	SW_SEL
F11	VSS	Power		
G1	VDD	Power		
G2	VSS	Power		
G7	PD15	I/O	GPIO_EXTI15	INT_LPS22HH
G8	PD14	I/O	GPIO_EXTI14	INT2_LIS2DW12
G10	PD13	I/O	GPIO_EXTI13	INT_HTS221
G12	VDD	Power		
H1	PH0-OSC_IN (PH0)	I/O	RCC_OSC_IN	RCC_OSC_IN
H2	PH1-OSC_OUT (PH1) *	I/O	RCC_OSC_OUT	RCC_OSC_OUT
H7	PE11 **	I/O	GPIO_Output	CS_LIS2DW12
J1	NRST	Reset		
J2	PC1	I/O	SPI2_MOSI	
J8	PE13 *	I/O	SPI1_SCK	SPI2_SCK [BLE]
J10	VSSDSI	Power		
K1	VSSA/VREF-	Power		
K5	PC5	I/O	GPIO_EXTI5	INT1_LIS2DW12
K8	PE15 *	I/O	SPI1_MOSI	SPI1_MOSI [SENSORS]
L1	VDDA	Power		
L5	PC4 *	I/O	ADC1_IN13	AN_VBATT
L6	VSS	Power		
L8	PE10 **	I/O	GPIO_Output	CS_IIS3DHHC
L10	PB12 **	I/O	GPIO_Input	SD_DETECT
L11	VDD	Power		
L12	VCAPDSI	Power		
M1	VSS	Power		

Pin Number UFBGA144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
M2	VDD	Power		
M3	PA3 *	I/O	ADC1_IN8	ADC1_IN8 [MICROPHONE]
M6	VDD	Power		
M8	PG1	I/O	GPIO_EXTI1	
M9	PE12 **	I/O	GPIO_Output	CS_LSM6DSOX
M10	PE14 *	I/O	SPI1_MISO	
M12	VSS	Power		

** The pin is affected with an I/O function

* The pin is affected with a peripheral function but no peripheral mode is activated

4. Clock Tree Configuration



5. Software Project

5.1. Project Settings

Name	Value
Project Name	SPBTLE
Project Folder	E:\Firmstart\Comtustec\ProjectMx\SPBTLE
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_L4 V1.17.0
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

5.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Copy only the necessary library files
Generate peripheral initialization as a pair of '.c/.h' files	No
Backup previously generated files when re-generating	No
Keep User Code when re-generating	Yes
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No
Enable Full Assert	No

5.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	MX_GPIO_Init	GPIO
2	SystemClock_Config	RCC
3	MX_USART2_UART_Init	USART2

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32L4
Line	STM32L4R9/S9
MCU	STM32L4R9ZIJx
Datasheet	DS12023_Rev0

6.2. Parameter Selection

Temperature	25
Vdd	3.0

6.3. Battery Selection

Battery	Li-SOCL2(A3400)
Capacity	3400.0 mAh
Self Discharge	0.08 %/month
Nominal Voltage	3.6 V
Max Cont Current	100.0 mA
Max Pulse Current	200.0 mA
Cells in series	1
Cells in parallel	1

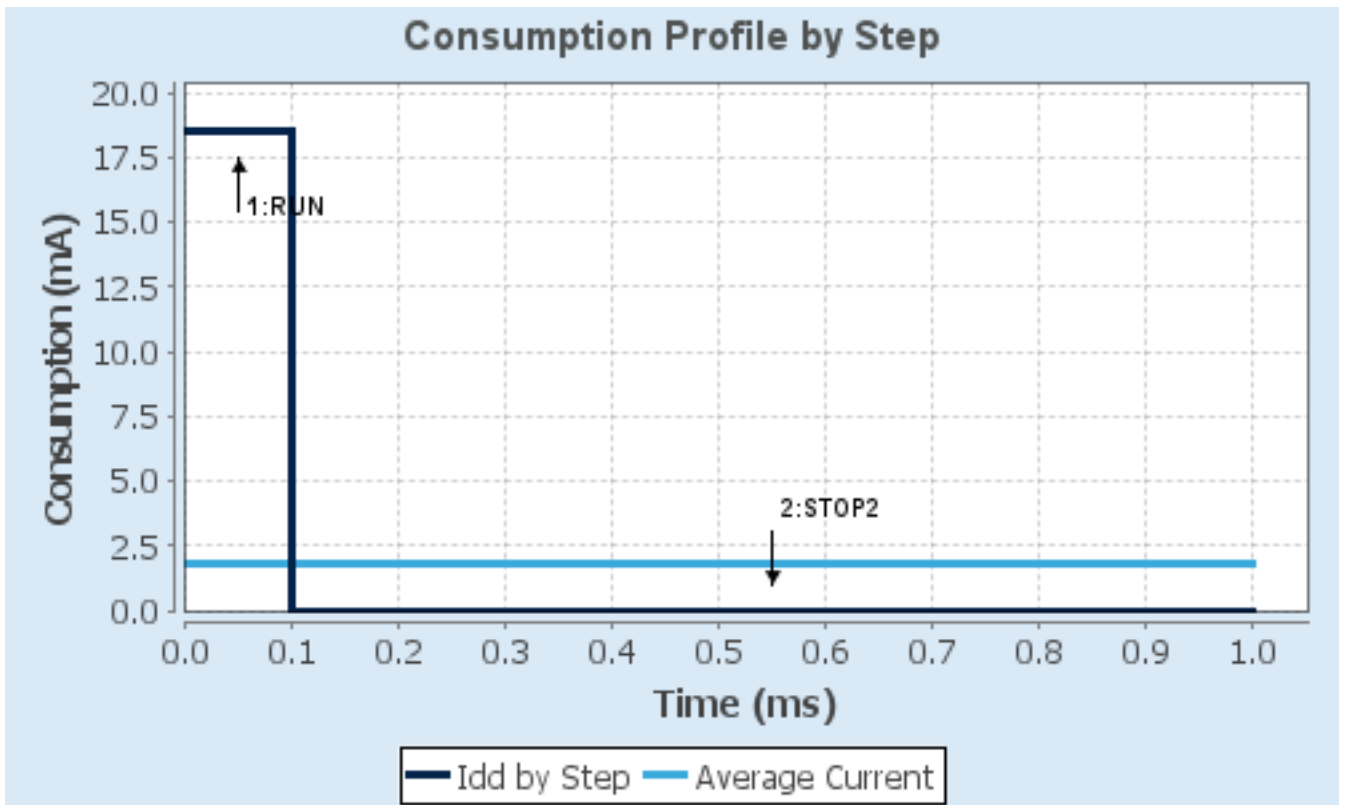
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP2
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-Boost	NoRange
Fetch Type	FLASH-SingleBank	n/a
CPU Frequency	120 MHz	0 Hz
Clock Configuration	HSE BYP PLL ART	ALL CLOCKS OFF
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	18.5 mA	2.55 μ A
Duration	0.1 ms	0.9 ms
DMIPS	150.0	0.0
Ta Max	102.06	105
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	1.85 mA
Battery Life	2 months, 15 days, 11 hours	Average DMIPS	150.0 DMIPS

6.6. Chart



7. Peripherals and Middlewares Configuration

7.1. RCC

High Speed Clock (HSE): BYPASS Clock Source

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

7.1.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Disabled
Data Cache	Enabled
Flash Latency(WS)	3 WS (4 CPU cycle)

RCC Parameters:

HSI Calibration Value	64
MSI Calibration Value	0
MSI Auto Calibration	Disabled
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
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7.2. SPI2

Mode: Full-Duplex Master

7.2.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits *
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	64 *
Baud Rate	1000.0 KBits/s *
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSSP Mode	Enabled

NSS Signal Type

Software

7.3. SYS

Timebase Source: SysTick

7.4. USART2

Mode: Asynchronous

7.4.1. Parameter Settings:

Basic Parameters:

Baud Rate	115200
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable
ClockPrescaler	1
Fifo Mode	Disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration

Advanced Features:

Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

7.5. STMicroelectronics.X-CUBE-BLE2.3.2.1

mode: WirelessJjBlueNRGAa2

7.5.1. Parameter Settings:

Log & Debug:

BLE2_DEBUG	0: No debug message
PRINT_CSV_FORMAT	0: .csv format message print disabled
BLUENRG2_DEBUG	0: No debug message

Basic Parameters:

HCI_READ_PACKET_SIZE	128
HCI_MAX_PAYLOAD_SIZE	128
HCI_READ_PACKET_NUM_MAX	10

Connection Parameters (for expert users):

Scan Interval (SCAN_P)	16384
Scan Window (SCAN_L)	16384
Supervision Timeout (SUPERV_TIMEOUT)	60
Min Connection Period (CONN_P1)	40
Max Connection Period (CONN_P2)	40
Min Connection Length (CONN_L1)	2000
Max Connection Length (CONN_L2)	2000
Advertising Type (ADV_DATA_TYPE)	Connectable Undirected Advertising (ADV_IND)
Min Advertising Interval (ADV_INTERV_MIN)	2048
Max Advertising Interval (ADV_INTERV_MAX)	4096
Min Connection Event Interval (L2CAP_INTERV_MIN)	9
Max Connection Event Interval (L2CAP_INTERV_MAX)	20
Timeout Multiplier (L2CAP_TIMEOUT_MULTIPLIER)	600

7.5.2. Platform Settings:

Exti Line	PD4
BUS IO driver	SPI2
Reset Line	PA8
CS Line	PD0

*** User modified value**

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
RCC	PC14-OSC32_IN (PC14)	RCC_OSC32_IN	n/a	n/a	n/a	RCC_OSC32_IN
	PC15-OSC32_OUT (PC15)	RCC_OSC32_OUT	n/a	n/a	n/a	RCC-OSC32_OUT
	PH0-OSC_IN (PH0)	RCC_OSC_IN	n/a	n/a	n/a	RCC_OSC_IN
SPI2	PD3	SPI2_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PD1	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PC1	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
USART2	PD6	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PD5	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
Single Mapped Signals	PB9	SDMMC1_CDIN	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_CDIN
	PB4 (NJTRST)	SPI3_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	SPI3_MISO [SENSORS]
	PC11	SDMMC1_D3	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_D3
	PB8	SDMMC1_CKIN	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_CKIN
	PB5	SPI3_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	SPI3_MOSI [SENSORS]
	PB3 (JTDO/TRACESWO)	SPI3_SCK	Alternate Function Push Pull	Pull-up *	Very High *	SPI3_SCK [SENSORS]
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	USB OTG DP
	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	USB OTG DM
	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	Very High *	I2C1_SDA [ENV SENSORS]
	PC10	SDMMC1_D2	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_D2

SPBTLE Project
Configuration Report

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PC9	SDMMC1_D1	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_D1
	PB6	I2C1_SCL	Alternate Function Open Drain	Pull-up	Very High *	I2C1_SCL [ENV SENSORS]
	PD2	SDMMC1_CMD	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_CMD
	PC12	SDMMC1_CK	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_CK
	PC6	SDMMC1_D0DIR	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_D0DIR
	PG8	I2C3_SDA	Alternate Function Open Drain	Pull-up	Very High *	I2C3_SDA [TEMPERATURE]
	PC7	SDMMC1_D123DIR	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_D123DIR
	PC8	SDMMC1_D0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	SDMMC1_D0
	PG7	I2C3_SCL	Alternate Function Open Drain	Pull-up	Very High *	I2C3_SCL [TEMPERATURE]
	PH1-OSC_OUT (PH1)	RCC_OSC_OUT	n/a	n/a	n/a	RCC_OSC_OUT
	PE13	SPI1_SCK	Alternate Function Push Pull	Pull-up *	Very High *	SPI2_SCK [BLE]
	PE15	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	SPI1_MOSI [SENSORS]
	PC4	ADC1_IN13	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	AN_VBATT
	PA3	ADC1_IN8	Analog mode for ADC conversion	No pull-up and no pull-down	n/a	ADC1_IN8 [MICROPHONE]
	PE14	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
GPIO	PE3	GPIO_EXTI3	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	INT2_LSM6DSOX
	PA15 (JTDI)	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Very High *	CS_LIS2MDL
	PE5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SD_SEL
	PD4	GPIO_EXTI4	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	
	PD0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SD_EN
	PE6	GPIO_EXTI6	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	INT2_IIS3DHHC
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BB_MODE

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PG10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CHG_LED2
	PF7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LDO_2V7_EN
	PG3	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	CHG_LED
	PG4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SW_SEL
	PD15	GPIO_EXTI15	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	INT_LPS22HH
	PD14	GPIO_EXTI14	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	INT2_LIS2DW12
	PD13	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	INT_HTS221
	PE11	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Very High *	CS_LIS2DW12
	PC5	GPIO_EXTI5	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	INT1_LIS2DW12
	PE10	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Very High *	CS_IIS3DHHC
	PB12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SD_DETECT
	PG1	GPIO_EXTI1	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	
	PE12	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Very High *	CS_LSM6DSOX

8.2. DMA configuration

nothing configured in DMA service

8.3. NVIC configuration

8.3.1. NVIC

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
Memory management fault	true	0	0
Prefetch fault, memory access fault	true	0	0
Undefined instruction or illegal state	true	0	0
System service call via SWI instruction	true	0	0
Debug monitor	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	0	0
EXTI line1 interrupt	true	0	0
EXTI line4 interrupt	true	0	0
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/35/36/37/38		unused	
Flash global interrupt		unused	
RCC global interrupt		unused	
EXTI line3 interrupt		unused	
EXTI line[9:5] interrupts		unused	
SPI2 global interrupt		unused	
USART2 global interrupt		unused	
EXTI line[15:10] interrupts		unused	
FPU global interrupt		unused	

8.3.2. NVIC Code generation

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Prefetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true
EXTI line1 interrupt	false	true	true
EXTI line4 interrupt	false	true	true

* User modified value

9. System Views

9.1. Category view

9.1.1. Current

10. Software Pack Report

10.1. Software Pack selected

Vendor	Name	Version	Component
STMicroelectronics	X-CUBE-BLE2	3.2.1	Class : Wireless Group : BlueNRG-2 SubGroup : Controller Version : 3.2.1 Class : Wireless Group : BlueNRG-2 SubGroup : HCI_TL Variant : Basic Version : 3.2.1 Class : Wireless Group : BlueNRG-2 SubGroup : HCI_TL_INTERF ACE Variant : UserBoard Version : 3.2.1 Class : Wireless Group : BlueNRG-2 SubGroup : Utils Version : 3.2.1

11. Docs & Resources

Type	Link
Datasheet	http://www.st.com/resource/en/datasheet/DM00366448.pdf
Reference manual	http://www.st.com/resource/en/reference_manual/DM00310109.pdf
Programming manual	http://www.st.com/resource/en/programming_manual/DM00046982.pdf
Errata sheet	http://www.st.com/resource/en/errata_sheet/DM00371862.pdf
Application note	http://www.st.com/resource/en/application_note/CD00160362.pdf
Application note	http://www.st.com/resource/en/application_note/CD00167594.pdf
Application note	http://www.st.com/resource/en/application_note/CD00211314.pdf
Application note	http://www.st.com/resource/en/application_note/CD00259245.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264321.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264342.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00042534.pdf
Application note	http://www.st.com/resource/en/application_note/DM00072315.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073742.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073853.pdf
Application note	http://www.st.com/resource/en/application_note/DM00080497.pdf
Application note	http://www.st.com/resource/en/application_note/DM00081379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00085385.pdf
Application note	http://www.st.com/resource/en/application_note/DM00087593.pdf
Application note	http://www.st.com/resource/en/application_note/DM00129215.pdf
Application note	http://www.st.com/resource/en/application_note/DM00151811.pdf
Application note	http://www.st.com/resource/en/application_note/DM00160482.pdf
Application note	http://www.st.com/resource/en/application_note/DM00156964.pdf
Application note	http://www.st.com/resource/en/application_note/DM00150423.pdf
Application note	http://www.st.com/resource/en/application_note/DM00209748.pdf

Application note http://www.st.com/resource/en/application_note/DM00125306.pdf

Application note http://www.st.com/resource/en/application_note/DM00141025.pdf

Application note http://www.st.com/resource/en/application_note/DM00144612.pdf

Application note http://www.st.com/resource/en/application_note/DM00148033.pdf

Application note http://www.st.com/resource/en/application_note/DM00209768.pdf

Application note http://www.st.com/resource/en/application_note/DM00216518.pdf

Application note http://www.st.com/resource/en/application_note/DM00220769.pdf

Application note http://www.st.com/resource/en/application_note/DM00227538.pdf

Application note http://www.st.com/resource/en/application_note/DM00257177.pdf

Application note http://www.st.com/resource/en/application_note/DM00269143.pdf

Application note http://www.st.com/resource/en/application_note/DM00272912.pdf

Application note http://www.st.com/resource/en/application_note/DM00226326.pdf

Application note http://www.st.com/resource/en/application_note/DM00236305.pdf

Application note http://www.st.com/resource/en/application_note/DM00260952.pdf

Application note http://www.st.com/resource/en/application_note/DM00263732.pdf

Application note http://www.st.com/resource/en/application_note/DM00269146.pdf

Application note http://www.st.com/resource/en/application_note/DM00296349.pdf

Application note http://www.st.com/resource/en/application_note/DM00327191.pdf

Application note http://www.st.com/resource/en/application_note/DM00338361.pdf

Application note http://www.st.com/resource/en/application_note/DM00287601.pdf

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Application note http://www.st.com/resource/en/application_note/DM00355687.pdf

Application note http://www.st.com/resource/en/application_note/DM00311483.pdf

Application note http://www.st.com/resource/en/application_note/DM00354244.pdf

Application note http://www.st.com/resource/en/application_note/DM00367673.pdf

Application note http://www.st.com/resource/en/application_note/DM00315319.pdf

Application note http://www.st.com/resource/en/application_note/DM00407776.pdf

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